



## CITY OF DURHAM

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September 10, 2007

Dr. David M. Moreau, Chairman  
North Carolina Environmental Management Commission  
1617 Mail Service Center  
Raleigh, North Carolina 27699-1617

RE: *Comments on the B. Everett Jordan Reservoir Nutrient Management Strategy*

Dear Dr. Moreau:

We appreciate the opportunity to comment on the proposed Nutrient Management Strategy (NMS) for Jordan Lake and express our concerns regarding implementation as currently planned. As the provider of drinking water for the citizens of Durham and Durham County, we are always concerned with maintaining high quality source water. We have managed both the quantity and the quality of our primary water sources (Lake Michie and Little River Reservoir) very carefully for many decades to ensure the ongoing delivery of high quality drinking water. In 2002, the City of Durham was awarded an allocation of ten percent of the water supply storage pool (estimated at ten million gallons of water per day) from Jordan Lake to meet future water supply needs of our citizens. For that reason, and many others, we have a vested interest in ensuring that the water quality of Jordan Lake remains suitable for use as a drinking water source for Durham, as well as for its other designated uses. We realize that a safe potable water supply and good water quality are important resources for the protection of public health, a healthy environment, and the continued prosperity of our region.

Our review of the proposed rules raised concerns about the tools and processes that were used to develop the management strategy for Jordan Lake and its watershed. Many of our concerns are based on the quantity and quality of the data, the ability of the Tetra Tech nutrient response model as a predictive tool, and the assumptions about uses and impacts which are subject to interpretation. Therefore, as stakeholders and stewards of the environment and public funds, we propose a phased, adaptive management approach for the NMS in which all the issues are examined, additional monitoring is carried out and the most fiscally and environmentally sound approach is developed.

Jordan Lake is a man made reservoir in the Piedmont Region of North Carolina. As such, the lake is shallow and the retention time in the New Hope Arm of the lake at times can exceed over one year, presenting ideal conditions for growing algae. Before the lake was

impounded, water quality modeling conducted by the Army Corps of Engineers, EIS, predicted that Jordan Lake would be eutrophic, but still would meet its intended uses. Thus, the lake is currently operating as was predicted in the original plans. The original EIS assumed no significant changes in loadings for nitrogen and phosphorus, but as a result of State and local actions, significant reductions in nutrients have occurred since 1983. In the April 2005 Draft NMS report, the Division of Water Quality has reported that the Upper Arm of Jordan Lake is impaired based on Chlorophyll *a* data and has placed it on the 303(d) list. We assert that (1) the water quality in Jordan Lake has been stable and has possibly improved – based on the NC Trophic State Index, and (2) the chlorophyll *a* data used in the model was flawed.

In the public meeting held on May 2, 2005, DWQ staff stated that the levels of nitrogen entering the Upper Arm have actually dropped. This is due to the numerous measures implemented by local governments to reduce the amount of nutrients and sediment exported from their jurisdictions. These efforts have resulted in steadily reducing the concentration of nitrogen within the New Hope Creek Arm. This assertion is proven by the DWQ memorandum *Trend Analysis of Nutrient and TSS Concentrations in the CFRB* (October 15, 2004). Despite increased residential and commercial development in the Upper New Hope Arm Subwatershed, the concentrations of total suspended solids and total phosphorus have remained constant in New Hope Creek from 1990-2004, and total nitrogen has decreased steadily since 1990. This trend will continue as the Durham County and Orange County (OWASA) WWTP's have completed upgrades of their facilities that include biological nutrient removal. Additionally, other indicators of water quality, such as the North Carolina Trophic State Index (NCTSI) have shown a marked improvement in water quality since the 1980s. The Trophic Index includes Chlorophyll *a* data, as well as phosphorus, nitrogen and secchi data. This index presents a broader assessment of overall water quality data and supports the fact that Jordan Lake is meeting all intended uses.

The Jordan Lake Nutrient Response Model that was developed to predict the lake condition uses Chlorophyll *a* data as one of the major inputs. However, due to sampling/testing problems during the model data years of 1997-2001, only fifteen (15) sampling events analyzed for chlorophyll *a* are being used to evaluate the status of water quality in Jordan Lake. In 2001 there were 12 sampling events and in 2003 there were 3 sampling events; no data was collected in 2002 and 2004. It is important to note that the third paragraph under "Overview of the Water Quality of the Cape Fear River Basin" on page 17 of the basinwide assessment report acknowledges the unusual hydrological and meteorological conditions during the five-year cycle. The report states:

*The basinwide monitoring in 2003 was significantly hampered by continuous high flows at many of the biological sampling sites. Many sites simply could not be sampled. Those that were sampled, have results complicated by the extreme drought in 2002, where many rivers and streams dried up that have never been known before to dry up. There was nothing typical about the*

*present 5-year basin cycle (1999 - 2003), and this must always be kept in mind when using the data presented in this report.*

Using the very limited data set collected during these conditions is hardly representative of the true conditions of the lake. There is also some question as to whether the model has even been validated for Chlorophyll *a*. There simply is not enough data utilized in the model to support lowering limits to the level of technology and the associated expense in operation and capital improvements that would require significant additional expenditure of public funds.

In addition, we continue to be concerned with the use of Chlorophyll *a* data as the primary indicator of lake health and/or impairment. Extensive research [AWWARF report #90693 Cyanobacterial (Blue-Green Algal) Toxins: A resource Guide] supports investigating other parameters to ensure the quality of drinking water sources. Chlorophyll *a* is an indicator of algal growth; however some algae are a critical part of the lake food chain. Over suppression/reduction of nitrogen can cause an imbalance in the ratio of nitrogen and phosphorus and encourage the growth of undesirable algae such as some species of blue-green algae due to their abilities to obtain nitrogen from the air. In addition to causing taste and odor complaints, these algae can also produce harmful toxins which are difficult to remove from drinking water. Blue-Green algae have lower levels of Chlorophyll *a*, thus using only the Chlorophyll *a* level as an indicator in this case would imply that the water quality was "safe" when it actually could be dangerous. During the May 2, 2005 public meeting, data was presented which showed low Chlorophyll *a* levels with high blue-green algae counts. Again, we suggest utilizing additional water quality parameters or indexes, such as the Trophic Index to better indicate the water quality of the lake.

Over the past 20 years, the City has invested more than \$60,000,000 to ensure that the water quality of New Hope Creek and Jordan Lake meets its intended uses. In 1995, the South Durham Water Reclamation was expanded and upgraded for biological nutrient removal at a cost of \$49,000,000. This was done without any regulatory requirement but in anticipation of future Total Nitrogen Limits. With these improvements, the City has accomplished a 56% decrease in Total Nitrogen loading and an 80% decrease in the Phosphorus loading to Jordan Lake. This decrease in nutrient loading has occurred despite the development and rapid growth in the area. The debt service associated with these improvements represents a considerable portion of the City's Water and Sewer budget and there are approximately ten years remaining in the payment cycle.

While the City of Durham remains committed to protecting the lake's water quality, we are concerned that the proposed requirements are based on a limited amount of suspect Chlorophyll *a* data and model uncertainty. We are not making an argument for no action; we are however urging the EMC to adopt an approach to implementing the nutrient reduction targets that adequately considers improvements for nutrient reduction that exist now or will exist in the near future before requiring more improvements that

may not be necessary. The City of Durham, like all participants of the Jordan Lake Stakeholder Project, supports and recommends that the EMC endorse a phased adaptive implementation which would include the following elements:

1. An enhanced water quality monitoring program of Jordan Lake and its tributaries to begin as soon as possible that provides representative water quality data consistent with the water quality standards. The four year monitoring program would complement the efforts of the DWQ as described in the *Nutrient Management Strategy* April 2005 draft document, and would be funded by local governments. The local government monitoring program would consist of eight in-lake locations, as well as a stream location on White Oak Creek. The monitoring program would include standard physical measurement, nutrients, total organic carbon, chlorophyll *a*, and analyses of algal species and density.
2. Following the four-year water quality monitoring period, local governments would fund a one-year project that would include enhancement (recalibration and validation) of the Jordan Lake Nutrient Response Model and a new evaluation of the TMDL and nutrient reduction targets for Jordan Lake. This would be done in conjunction with a comprehensive review by DWQ of North Carolina's water quality standards for nutrients and/or chlorophyll *a*. The recalibrated and revalidated model would be used for a new analysis of nutrient targets for the three arms of Jordan Lake (Upper New Hope, Lower New Hope and Haw River).
3. We recommend that the EMC commit to reviewing the proposed enhanced Jordan Lake Nutrient Response Model upon its completion, and with DWQ recommendation, approving its application for nutrient target analyses.
4. Further, we recommend that the EMC commit to re-evaluating the Jordan Lake TMDL, nutrient reduction targets, and nutrient management strategy based on the results of the TMDL and nutrient target analyses conducted with the approved (calibrated and revalidated) Jordan Lake Nutrient Response Model with particular emphasis on the potential impact of the Nitrogen to Phosphorus ratio on encouraging the production of Blue-Green algae.

As mentioned earlier, the current water quality in Jordan Lake is stable with some indications of improvement. With the completion of the on-going upgrades and expansions of the Durham County wastewater treatment plant, the Orange Water & Sewer Authority's Mason Farm Plant and the implementation of Phase II Stormwater Rules, nutrient levels in the Upper New Hope Arm should continue to drop significantly during the data collection and model validation period. In addition, the City of Durham is currently in the midst of an optimization study at the South Durham Water Reclamation Facility as we continue to optimize phosphorus and nitrogen removal.

The City has demonstrated a commitment to clean water in Jordan Lake with significant expenditures over the past 20 years. This lake is a part of our drinking water supply. We

have a responsibility to the rate payers to ensure that any additional expenditures are based on sound science and accurate data. The proposed phased adaptive approach to data collection and evaluation will help to ensure confidence in the model and the resulting nutrient management strategy.

Sincerely,

A handwritten signature in black ink, reading "Vicki Westbrook". The signature is fluid and cursive, with the first name "Vicki" and last name "Westbrook" clearly legible.

Vicki Westbrook, Acting Director

CC: Secretary William Ross, DENR  
Robin Markham, DENR  
Colleen Sullins, DENR  
Rich Gannon, DENR  
Patrick Baker, City Manager  
Theodore Voorhees, Deputy City Manager  
Karen Sindelar, Senior Assistant City Attorney  
William V. Bell, Mayor  
Durham City Council